

# The Bikeway Network

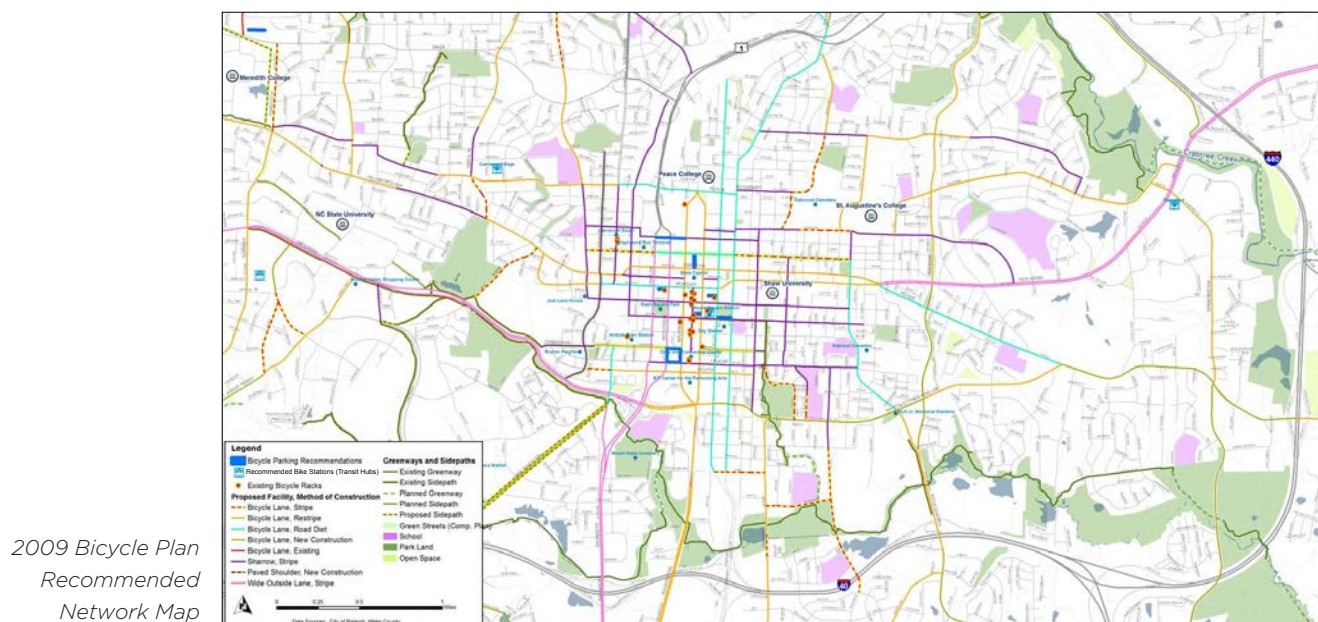
## Project Vision:

“Raleigh is a place where people of all ages and abilities bicycle comfortably and safely for transportation, fitness, and enjoyment. The BikeRaleigh network is integrated into the transportation system to connect people to where they live, work, play, and learn.”

The 2009 Bike Network represented a “comprehensive set of proposed bicycle transportation facilities” with the bicycle lane as the preferred facility. The 2015 Plan Update broadens the toolbox and identifies a connected network for the “Interested but Concerned” population.

The current best practices for creating safe streets for the broadest range of people riding bicycles are protected bikeways, neighborhood bikeways, and off-street trails and greenways. By identifying the best routes to employ protected and neighborhood bikeways, the resulting plan is a bicycle facility network where people feel safe and comfortable riding their bicycles from their neighborhood to any destination within the City.

This chapter features the recommended bicycle network, with a discussion of facility types, bicyclist types, and network methodology.



## TYPES OF BICYCLISTS

Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of people. A framework for understanding the characteristics, attitudes, and infrastructure preferences of different bicyclists in the US population as a whole is illustrated below. The 2009 Raleigh Bicycle Plan laid out a framework of facilities that featured the best practices at the time. The network addressed the “Enthusied and Confident” user but did not adequately account for the “Interested but Concerned” bicyclist group. The bicyclist types are described below.

### HIGHLY EXPERIENCED (APPROXIMATELY 1% OF POPULATION)

Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes, and will typically choose roadway connections -- even if shared with vehicles -- over separate bicycle facilities such as shared use paths.



### ENTHUSED AND CONFIDENT (~ 5-10% OF POPULATION)

This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or multi-use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes commuters, recreationalists, racers, and utilitarian bicyclists.



### INTERESTED BUT CONCERNED (~ 60% OF POPULATION)

This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or multi-use trails under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become “Enthusied & Confident” with encouragement, education, and experience.



### NO WAY, NO HOW (~ 30% OF POPULATION)

Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.

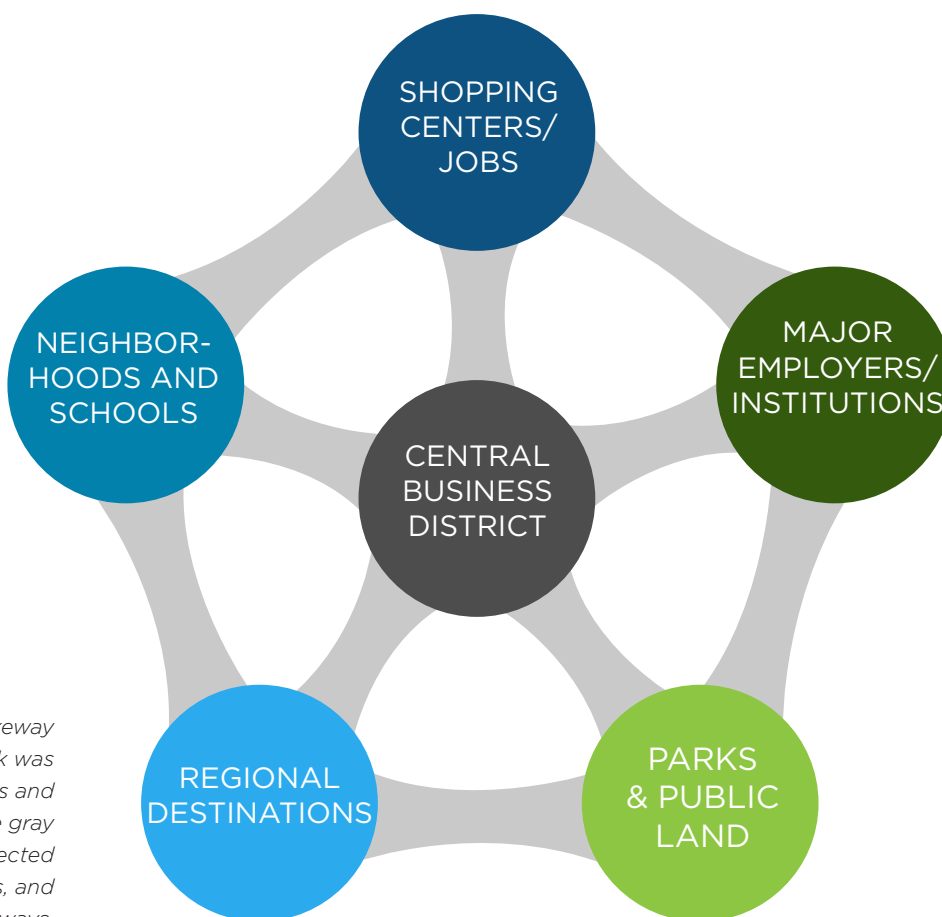


Source: *Four Types of Cyclists*. (2009). Roger Geller, City of Portland Bureau of Transportation. Supported by data collected nationally since 2005.

## BICYCLE NETWORK DEVELOPMENT

This plan update identifies a long-term vision for a network of protected bikeways and neighborhood bikeways. Most roadways that are not neighborhood streets are required by City code to have bicycle lanes; these roadways were also identified in the comprehensive network. However, the protected bikeway and neighborhood bikeway networks will be the focus of this plan update's prioritization and implementation chapters.

The project team used the 2009 bicycle network recommendations, public input, gap analysis, equity analysis, and the results of the Level of Traffic Stress (LTS) analysis (described in Chapter 2) to develop the network of protected bikeways and neighborhood bikeways. A “Hubs and Spokes” approach was used to identify key areas of demand (where people live and work) to link them with key destinations (where people learn, play, shop, dine, and recreate).



*The 2015 Bikeway Network was developed using a “Hubs and Spokes” approach. The gray spokes include protected bikeways, bicycle lanes, and greenways.*

## BICYCLE NETWORK DEVELOPMENT DIAGRAM





*Boston, MA implemented buffered bike lanes along Morton Street.*

## WHAT IS A PROTECTED BIKEWAY?

This plan update defines a protected bikeway as a bicycle facility that is physically separated from motor vehicle traffic within a street corridor. ***For this Plan, this includes cycle tracks and buffered bike lanes, in addition to the City's shared-use path and greenway network.*** The on-road physical separation can be achieved through parked cars, curbs, medians, bollards/traffic posts, planters, or marked buffered space between the bike lane and adjacent travel lane.

## WHY PROTECTED BIKEWAYS?

Raleigh's bicycle network has been expanded significantly in recent years, and people are biking. However, not everyone feels comfortable and safe riding on a busy street, even with a bike lane. There are some parts of the city where potential bicycling demand is high, yet low-stress bikeway facilities such as trails and lower-traffic streets are not an option. Protected bikeways can be a low-stress facility that provides vital connections to key destinations.



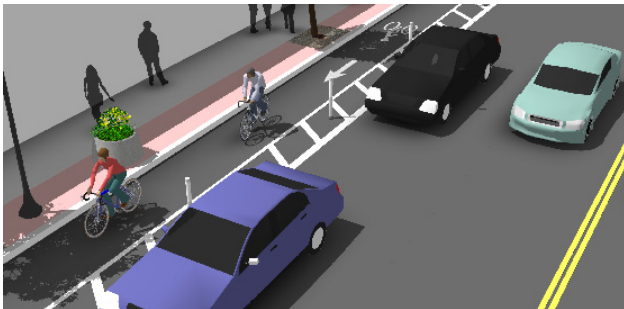
*The City of Atlanta, GA installed a two-way cycle track with bollards/flexible posts along 10th Street.*



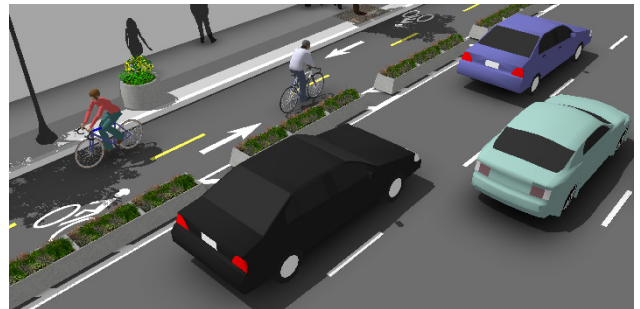
*An existing sidepath along Western Boulevard in Raleigh.*

**ON-ROAD PROTECTED BIKEWAY EXAMPLES**

Of all on-street bicycle facilities, cycle tracks and buffered bicycle lanes offer the most protection and separation from adjacent motor vehicle traffic. Cycle tracks may be one-way or two-way, and may be at street level, or raised to the sidewalk or an intermediate level. For more detailed information, see the Design Guidelines appendix of this Plan.

**ONE-WAY CYCLE TRACK**

One-way cycle tracks are physically separated from motor vehicle traffic and typically provide bicycle travel in the same direction as motor vehicle traffic. They may be at street level, or distinct from the sidewalk, as a raised cycle track. In situations where on-street parking is allowed, cycle tracks are located adjacent to the curb and sidewalk, with on-street parking repositioned to buffer people on bicycles from moving vehicles.

**TWO-WAY CYCLE TRACK**

A two-way cycle track is an on-street bicycle facility that allows bicycle movement in both directions on one side of the street. Two-way cycle tracks must provide clear and understandable bicycle movements at intersections and drive-ways. Education is important to inform people how to travel in a safe manner.

**BUFFERED BICYCLE LANE**

Buffered bicycle lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. A buffered bicycle lane could potentially be converted to a cycle track.

**INTERSECTION TREATMENTS FOUND IN THE DESIGN GUIDELINE APPENDIX INCLUDE:**

Intersection markings

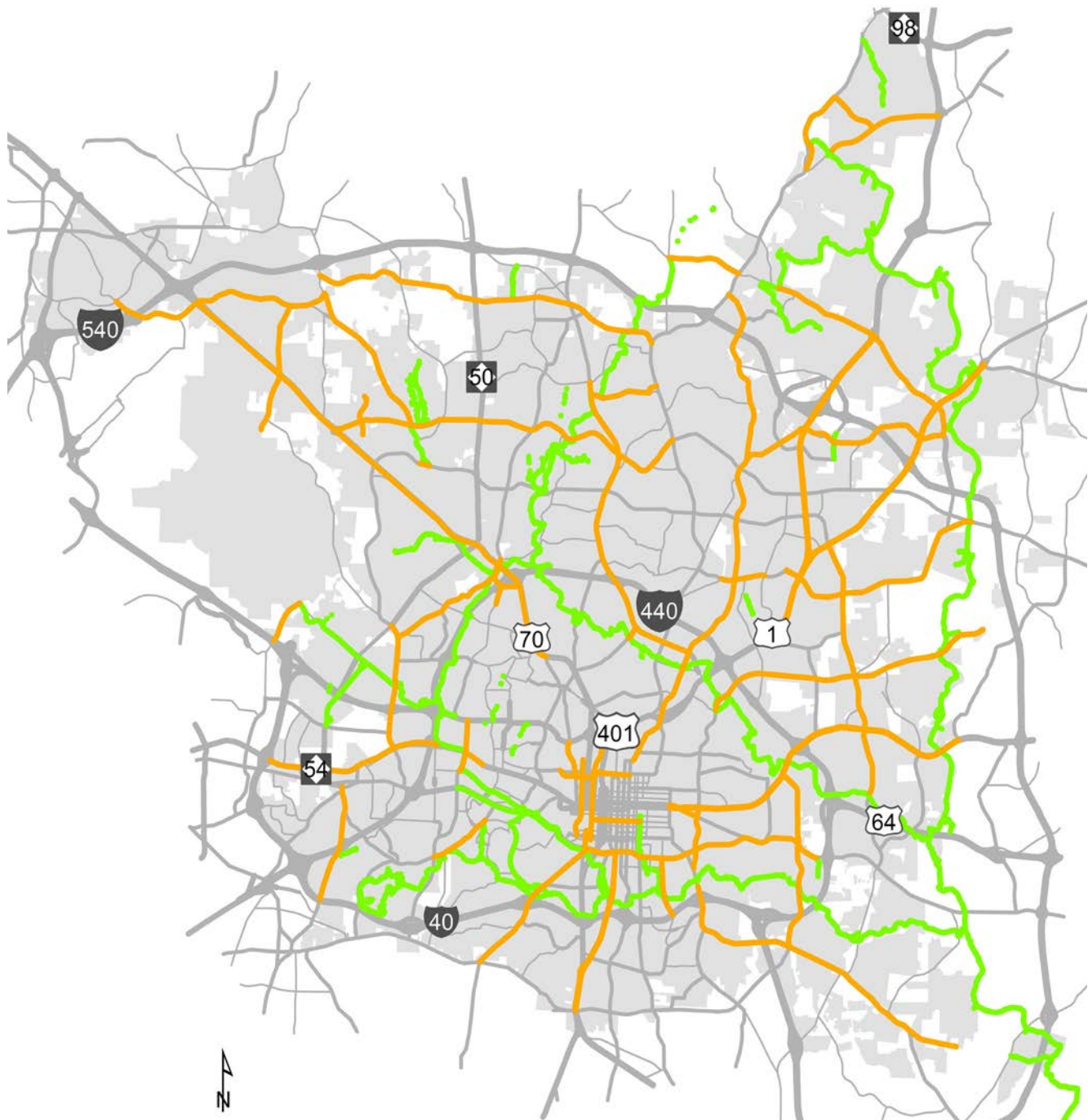
Bicycle signal head and protected signal phase

Two-stage turn boxes

Separated bikeway mixing zone



Map 3.1: Protected Bikeway Network



**LEGEND**

- PROTECTED BIKEWAY
- - EXISTING GREENWAY TRAIL



### WHAT IS A NEIGHBORHOOD BIKEWAY?

Neighborhood bikeways, also known as “bicycle boulevards” are low stress, active transportation corridors that have been optimized for bicycle travel. These corridors take advantage of the existing low-speed and low-volume local street network with enhanced crossings where routes cross major roadways. There are a wide variety of elements in a successful neighborhood bikeway, including:

#### WAYFINDING SIGNS & MARKINGS

Signs and pavement markings comprise the basic elements of a neighborhood bikeway. These elements differentiate the facility from other local streets and identify the bicycle boulevard as a shared street that has been optimized for bicycle and pedestrian travel. Possible tools include:

- » Warning Signage
- » Modified Street Signs
- » Wayfinding Signage
- » Pavement Markings
- » Shared Lane Markings (Sharrows)



#### SPEED MANAGEMENT

The closer that the operating speed of bicyclists is to motor vehicle traffic, the more comfortable it is for bicyclists. Possible treatments to reduce speed include:

- » Reduced Speed Limits
- » Horizontal and Vertical Deflection (Curb extensions, mini traffic circles, speed cushions, narrow streets, etc)



#### VOLUME MANAGEMENT

Maintaining motor vehicle volumes below 3,000 vehicles per day (vpd), where 1,000 - 1,500 vpd is preferred, significantly improves bicyclists' comfort. To manage volume, physical, or operational measures can be taken on routes that have been identified as a neighborhood bikeway. Possible measures include:

- » Traffic restriction signage
- » Choker Entrances
- » Diagonal Traffic Diverters
- » Median Diverters

*Examples of neighborhood bikeway treatments from Minneapolis, MN (top photo), Los Angeles, CA (middle photo) and Milwaukee, WI (bottom photo).*



*Santa Monica, CA created a pop-up bicycle boulevard to test intersection treatments along Michigan Avenue.*

### INTERSECTION DESIGN

The level of design emphasis required at intersections along a neighborhood bikeway is dependent on whether the intersection occurs at a major or minor street and the complexity of the intersection. Striking a balance between maximizing bicyclist safety and minimizing bicyclist delay is essential. Possible design measures include:

- » Stop Sign Placement
- » Neighborhood Traffic Circles
- » Bicycle Detection at Signalized Intersections
- » Bike Boxes
- » Median Refuge Islands
- » Mid-block Crossings
- » Bike Left-Turn Lanes

### WHY NEIGHBORHOOD BIKEWAYS?

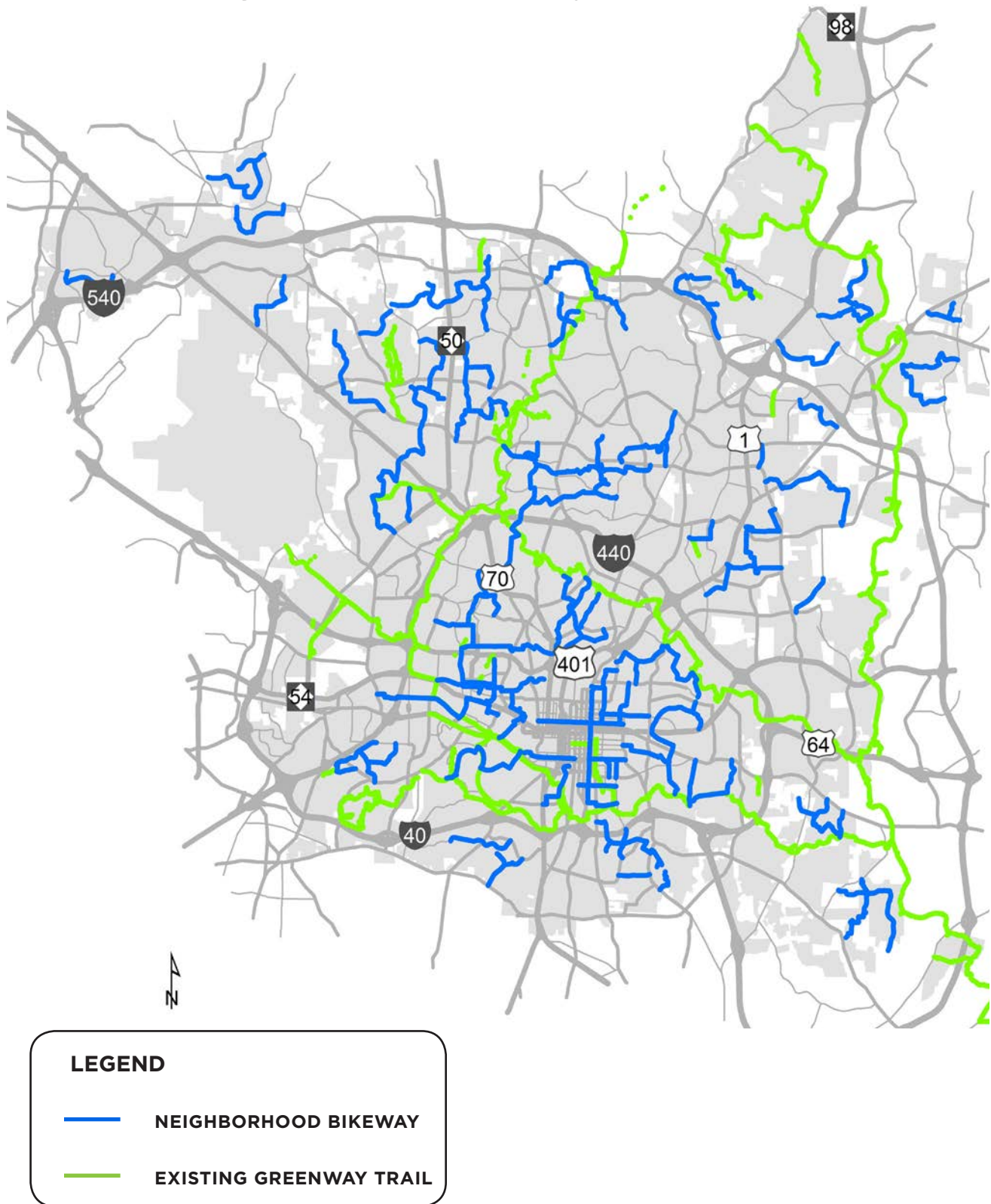
Neighborhood bikeways appeal to the widest range of bicycle users, especially the “interested but concerned” group. Benefits of neighborhood bikeways include:



*An example of a neighborhood traffic circle installed along a Rochester, NY bicycle boulevard.*

- » *Good for all ages, all abilities* – Many bicyclists, or people interested in bicycling, are not comfortable riding in bike lanes on major roads.
- » *Lower speeds and traffic volumes* – These bikeways are more comfortable, attractive facilities due to fewer interactions with motor vehicles and lower overall traffic speeds.
- » *Connects to destinations* – These bikeways connect cyclists to key destinations, such as greenways, while reducing the amount of time spent on bikeways along major roads.
- » *Low-cost and ease of implementation* – For relatively low investment, a neighborhood bikeway can take advantage of existing infrastructure and include spot treatments, sharrows, and signage.

Map 3.2: Neighborhood Bikeway Network



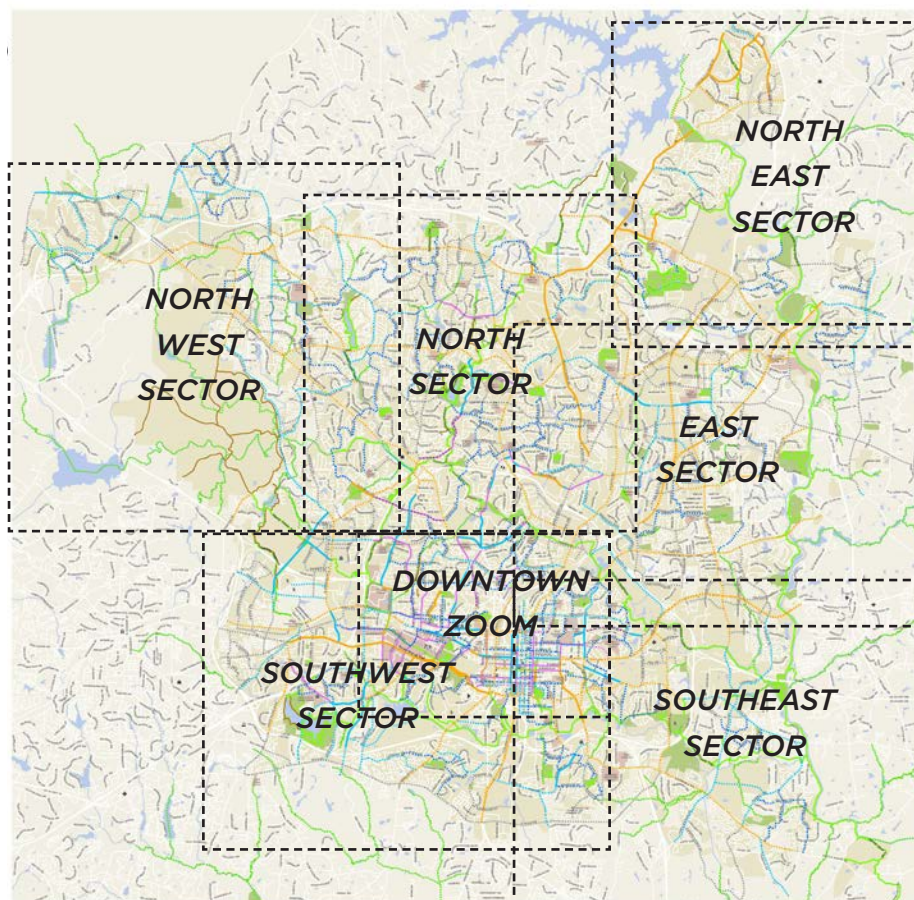
## THE 2015 RECOMMENDED NETWORK

The 2015 bikeway recommendations, both low-stress and conventional, are shown by geographical sector on Maps 3-4 through 3-8 (see map key below). Table 3-1 shows the mileage breakdown of existing bicycle facilities, recommended network improvements by facility type, and total network miles. The full bicycle network project list is in Appendix A. For a full description of facility types, see the Design Guidelines chapter.

**TABLE 3-1: 2015 BICYCLE NETWORK (SHOWN IN MILES)**

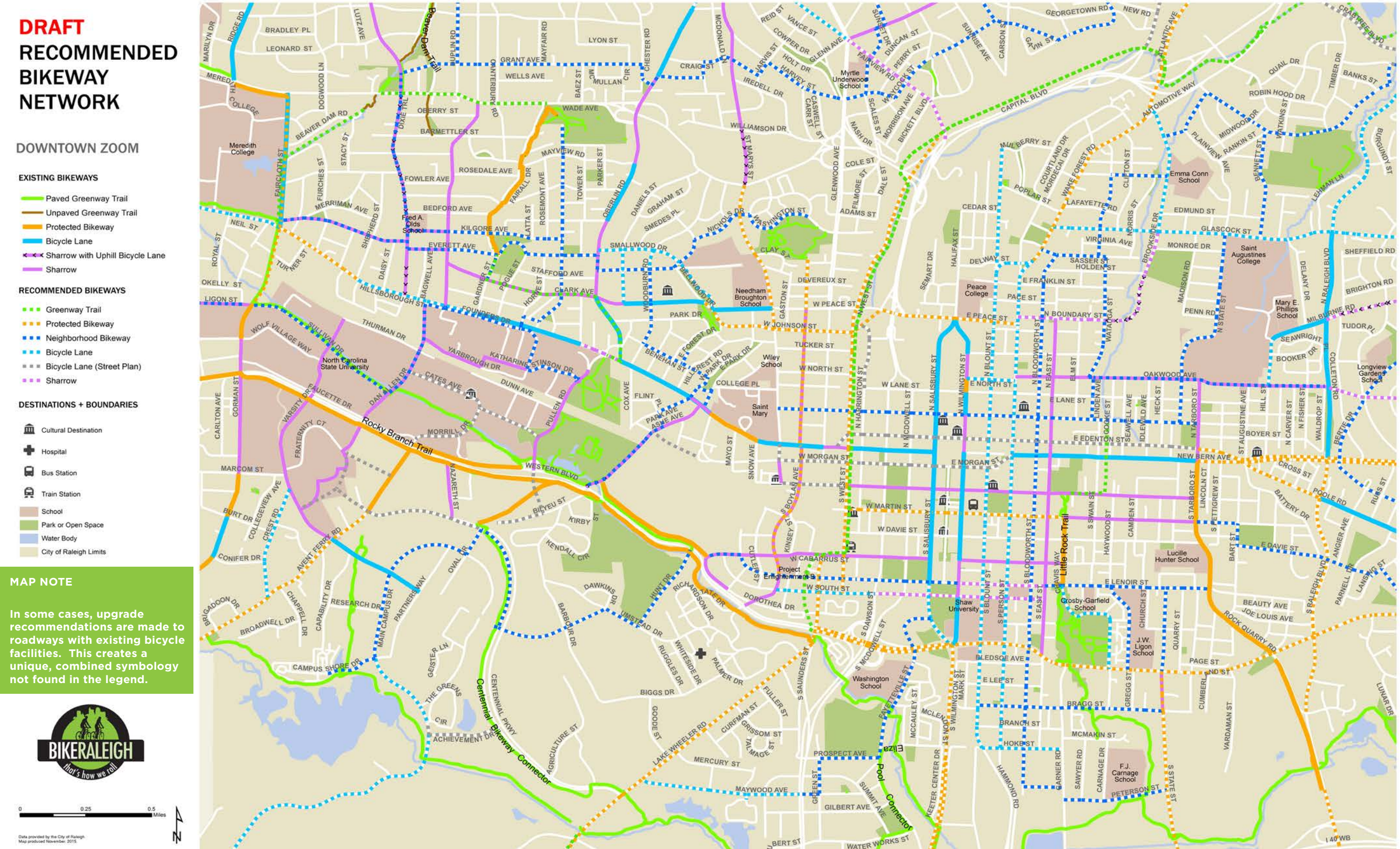
Facility Type	Existing Facilities	New Facilities	Total Network	Percent of Total Network
Greenway Trail	114	126	240	<b>28%</b>
Protected Bikeway	6	149	155	<b>19%</b>
Neighborhood Bikeway	0	120	120	<b>14%</b>
Bicycle Lane	33	277	310	<b>36%</b>
Sharrow	26	3	29	<b>3%</b>
<b>Total</b>	<b>179</b>	<b>675</b>	<b>854</b>	<b>100%</b>

Map key of the seven sector maps detailing the 2015 Network Recommendations on pages 3-13 through 3-19.

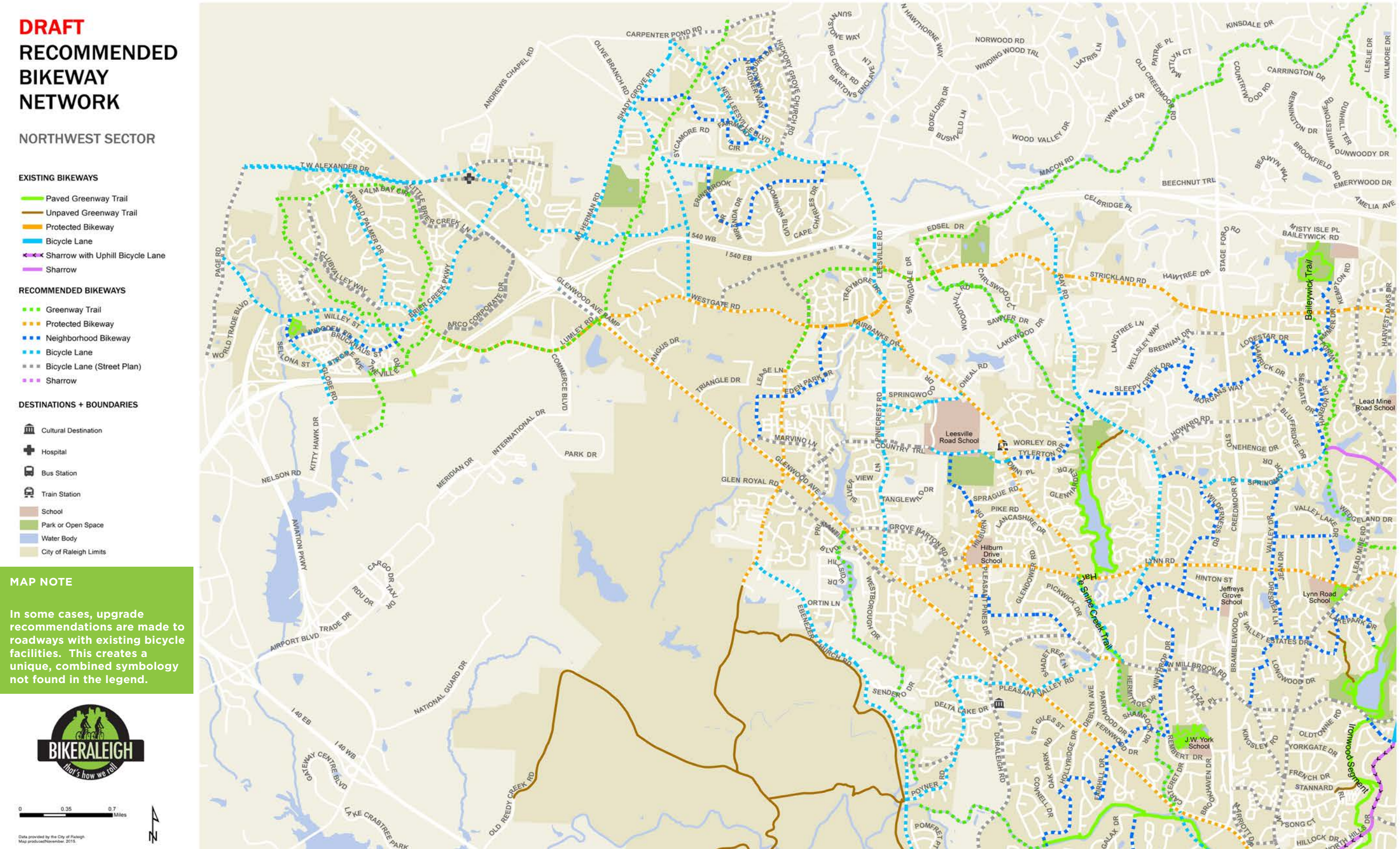


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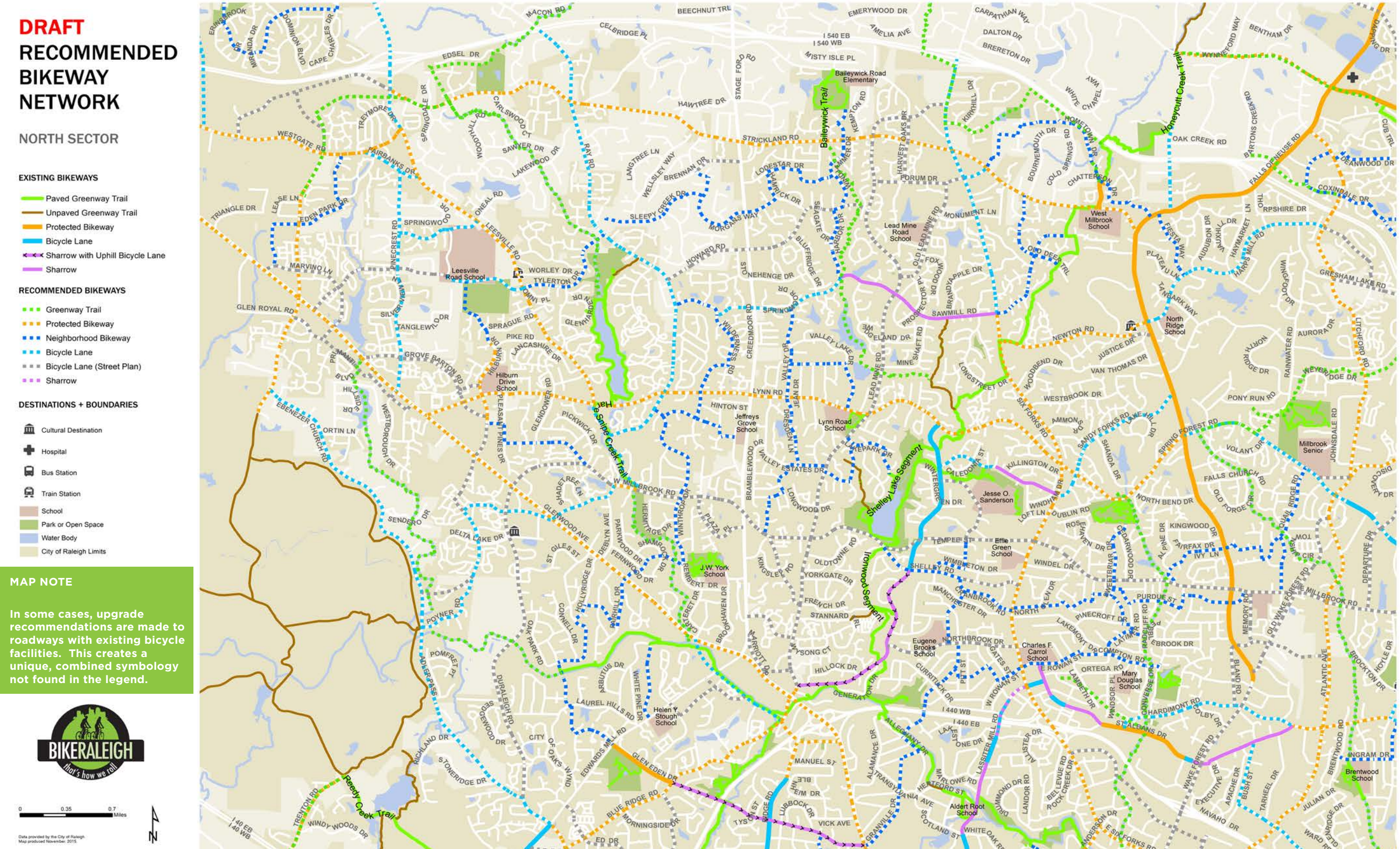
Map 3.3: Downtown Zoom



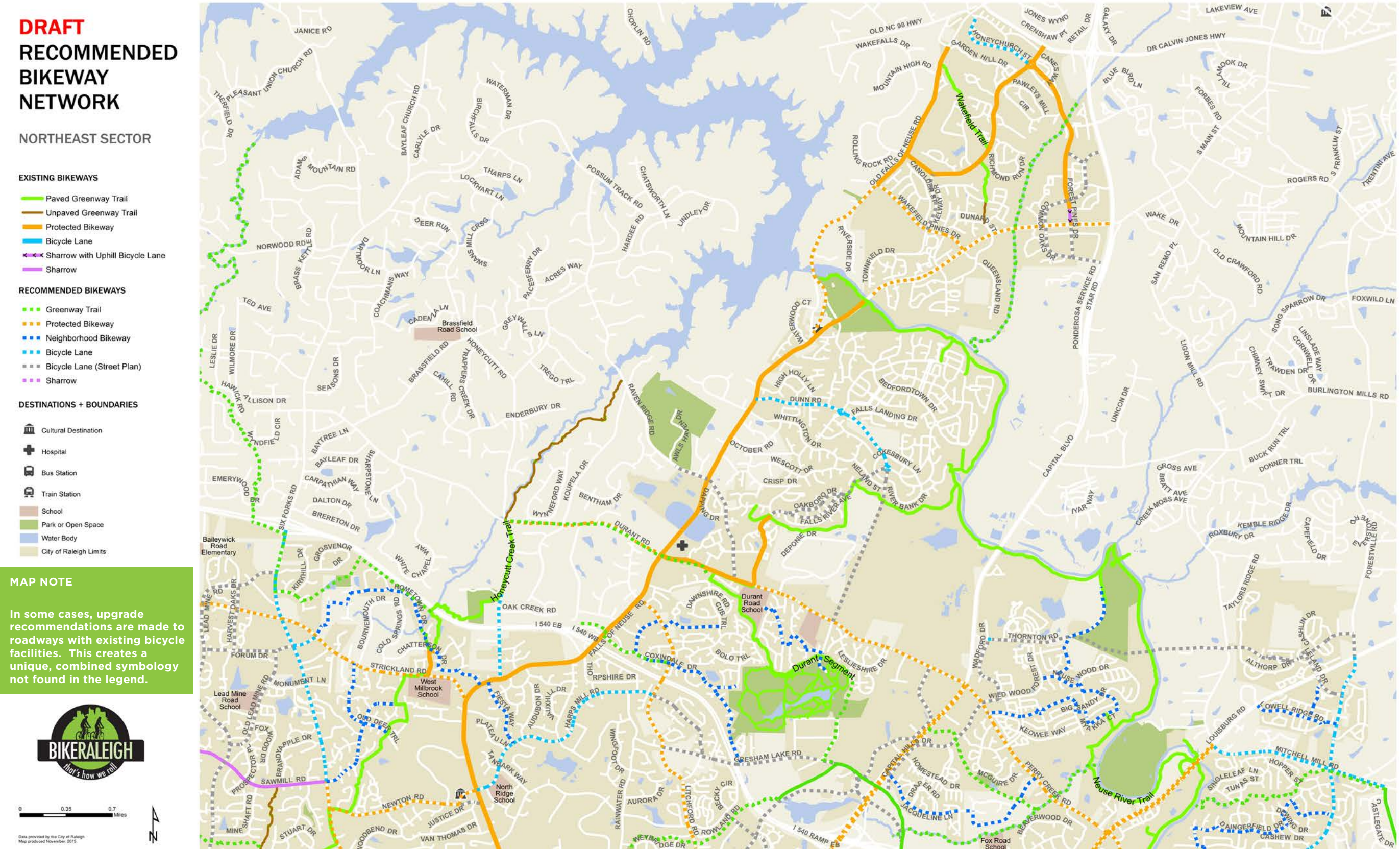
Map 3.4: Northwest Sector



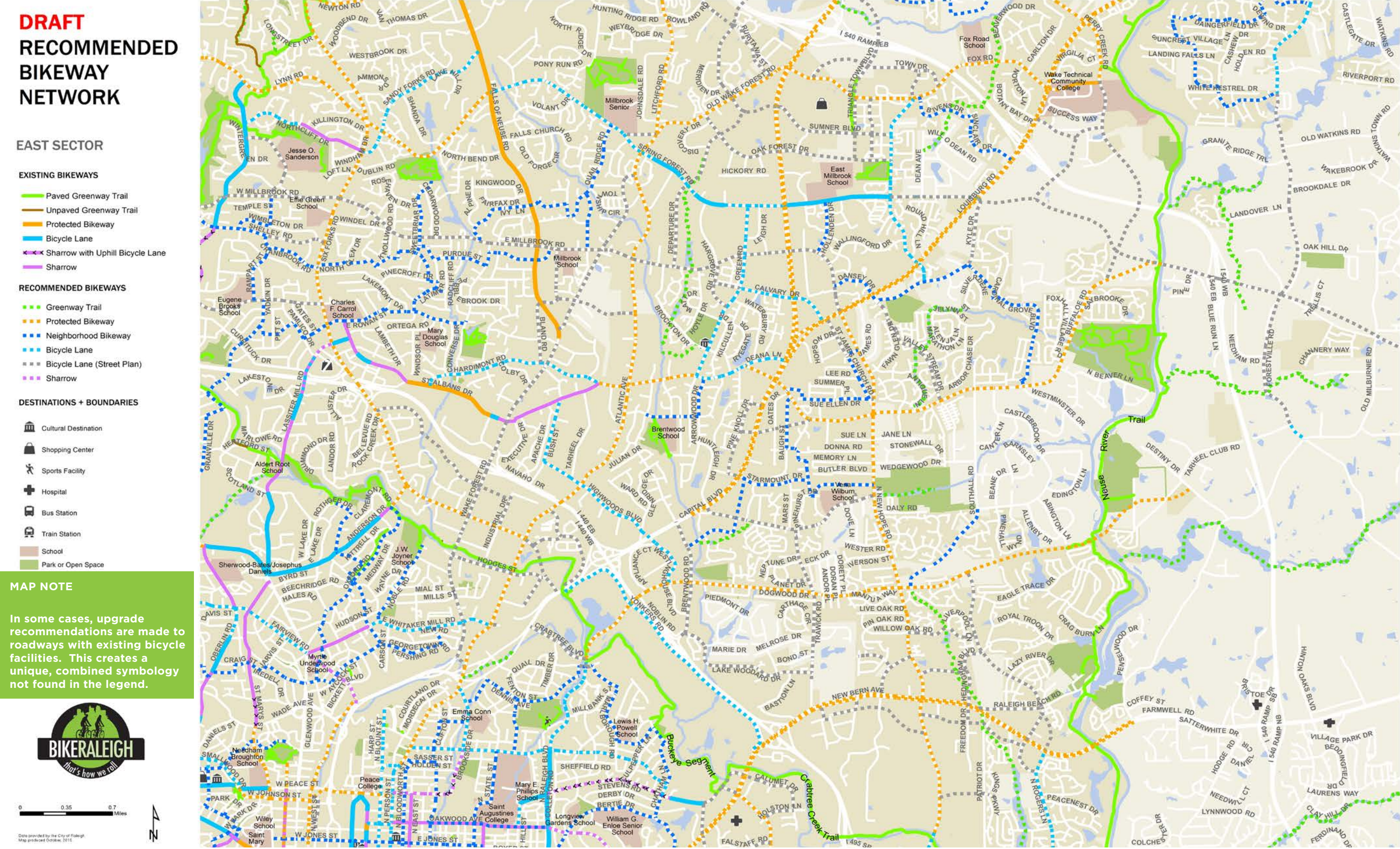
Map 3.5: North Sector



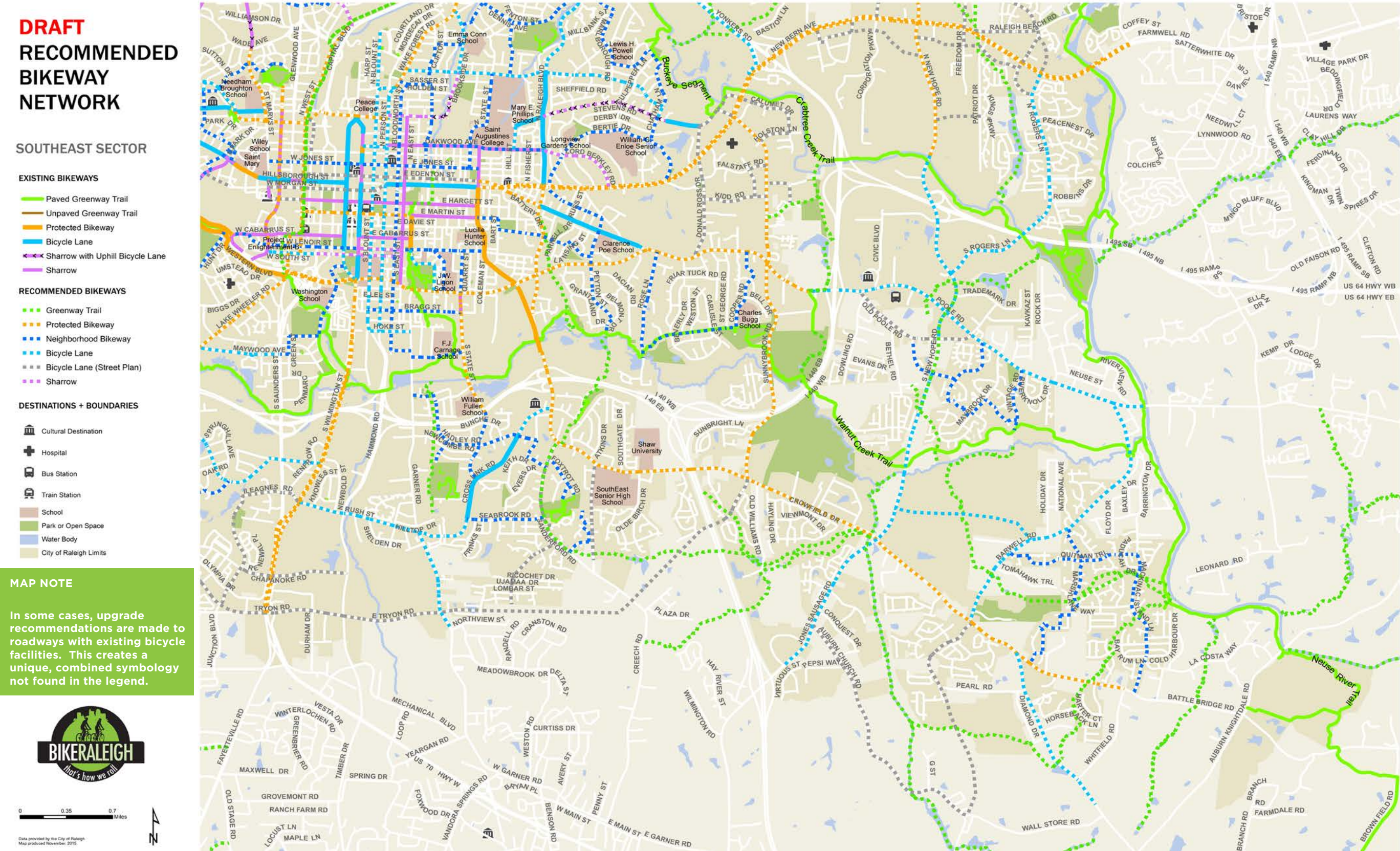
Map 3.6: Northeast Sector



Map 3.7: East Sector



Map 3.9: Southeast Sector



Map 3.8: Southwest Sector

